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REMARKABLE AURORA OF MAY 14-15, 1921.

By HERBERT LYMAN.

[Weather Bureau, Washington, August 1, 1921.]

In the United States, from latitude 40° northward, auroras of more or less brilliance are usually observed several times in the course of a year. The display of May 14-15, 1921, however, was exceptionally noteworthy in two particulars; first, its accompanying earth currents caused the greatest demoralization to telegraphic communication ever recorded, and secondly, it was seen in extreme southern latitudes with all the brilliance usually observed in the north. In geographic extent it was very widespread. Reports thus far received show that the display was witnessed from northern and central Europe westward over the Atlantic, across the United States and far over the Pacific, reaching as far south as Apia, Samoa.

THE AURORA AND COMMUNICATION.

The following reports taken from the press of the country will give a good idea of the great difficulties experienced by the telegraphic and cable companies as a result of the excessive earth currents accompanying the aurora. In contrast to this state of affairs it is interesting to learn that radio transmission was not only not hindered but in many cases the signals were reported to have come in even better than usual.

New York, May 15, 1921.—Telegraph service throughout the United States was impeded seriously last night by an electrical disturbance caused by the aurora borealis or northern lights.

The heaviest effect of the phenomenon was felt on the lines of the Western Union Telegraph Co. in the West and South, while those in New England, it was said, although under its influence, were not so badly affected.

Officials of the Western Union Telegraph Co. declared the cause of the disturbance to be due to an extra voltage, which entered the wires at one unknown point and left them at another. The variability of the extra voltage, which did not remain constant for more than a period of a few minutes, made it impossible to adjust the telegraphic apparatus and overcome the disturbance.

At the New York end of a wire which extends to Pittsburgh the current varied within a short time from 300° positive to 80°. The lights of the aurora borealis were reported visible in great brilliancy at Scranton, Pa., and points between there and Pittsburgh.

The greatest disturbance to the operation of the telegraph by the aurora borealis here was noted last night at 11.30 o'clock, when earth currents, due to the northern lights, registered 1,000 volts. The highest previous voltage recorded was 200, according to the wire chief of the Western Union Telegraph Co. The increasing voltage of earth currents was first noted Friday at 3 p. m.—*New York Times*, May 15, 1921.

Helena, Mont., May 15, 1921.—The electrical storm was said to be the worst in the history of the Mountain States Telephone & Telegraph Co.'s operations in Montana. Advices reaching here by relay from several repeating stations was to the effect that the storm extended in an arc from Chicago to San Francisco and into the Pacific ocean. The severity of the storm is indicated by the fact that for the first time in history the telegraph and cable lines to Alaska were completely out of commission for a time and that Territory isolated from the outside world.

COMPLETELY AT ITS MERCY.

Shortly before midnight it was learned that Denver, Salt Lake, San Francisco, Seattle, Spokane and Winnemucca, all important telegraph points were completely at the mercy of the elements. With frequency the electrical discharges would enter the earth from the heavens and completely polarize these points of entrance. Then for a few minutes the air and ground would be cleared and an attempt to resume operation would be made only to result in failure through the continued activities of the northern lights.

The condition of Helena was particularly severe. For only momentary remissions would the electrical discharge be drawn from the wires. Polarization would be reported from Bozeman, with a report following immediately from Spokane that the center of activity had shifted to Spokane. Then Salt Lake would begin to report that the wire was cleared and the message would be suddenly cut short before other information could be transmitted.—*The Independent*.

Operators puzzled.—Those who saw the strange lights were not more puzzled than telegraph operators between Chicago and San Francisco whose machines cut up queer capers. For a time the instruments clicked away, sometimes sending what made sense and at other times sending dashes of almost intelligence which left operators wondering what was happening.—*San Francisco Examiner*, May 15, 1921.

French wires affected.—The disturbance which interrupted telegraphic transmission in the United States last week has been making itself felt also in France.

On Saturday night especially the operators at the central transmission stations came to the conclusion that a strange force had got into their instruments, for nothing would go right. Morse instruments, instead of making dots and dashes, recorded one long line. Hughes instruments produced words in what might have been an unknown language, and Baudot, of which French telegraphers are proud because it is very intricate, seemed possessed by evil spirits.

The phenomenon was first noticed in western France late on Friday evening and gradually spread eastward. All lines were not affected similarly, neighboring ones behaving normally or eccentrically from no known reason.

One feature was that while earth currents were disturbed, the wireless apparatus remained unaffected.—*New York Times*, May 18, 1921.

The Western Union Telegraph Co. reports that the magnetic disturbances accompanying the aurora on May 15 blew out fuses, injured electrical apparatus, and did other things which had never been caused by any ground and ocean currents known in the past. It appears as though the company will probably have to send out ships to drag up the cables to repair the damage produced by straying currents.—*Scientific American*, New York, May 28, 1921, page 423.

Brewster, N. Y., building burned as a result of static electricity associated with the auroral display of May 15.—Static electricity, due to the aurora borealis, which was of unusual brilliance late Saturday night, caused a fire which totally destroyed the Central New England Railroad station in Brewster, N. Y., affected the telegraph and telephone system of the entire railroad system, and disorganized the circuits of the Western Union and Postal Telegraph Co.'s and put nearly all of the toll line circuits of the Southern New England Telephone Co. out of commission.

The electrical phenomenon was widespread over the country, starting in the early evening in some parts of the country and continuing until dawn. In this section the display appeared to be at its height between 11 and 12 o'clock, and it was at that time the static electric caused the fire in Brewster.

Unlike other displays of the aurora borealis, the shafts of light completely encircled the city and some of the time was directly overhead. It shot about in varicolored waves, creating a beautiful and at the same time an awe-inspiring spectacle. The disturbance did not abate, according to press reports, until the coming of dawn.

The fire in the Brewster railroad station started at 10:15 o'clock. Operator Hatch was working at the key when a flash of flame came out of it. He closed the key and started to pull the plug when another flash of flame came. Looking up, Hatch saw that the switchboard was in flames.—*Danbury Evening News*, May 18, 1921.

REPORTS OF OBSERVATIONS.

The descriptions below have been culled out from a large number sent in to the Weather Bureau. An effort has been made to select a few representative of the several sections of the country. For convenience they have been arranged approximately in belts extending across the country from east to west for each 5° of latitude. Thus the first belt takes in the area between the fortieth and forty-fifth parallels, the second that between 35° and 40°, etc.

Middletown, Conn.—A very bright auroral display was observed here on the evening of May 14. The sky was overcast until 10 p. m. As the clouds dissolved the aurora was noted in spite of the bright moonlight.

The focus of display was near the zenith in the vicinity of the star Arcturus. From that point streamers radiated in all directions constantly changing both in position and in intensity. Across these streamers pale green pulsating clouds drifted, in general from north to south, but occasionally assuming a spiral form around the zenith. They attained their maximum brightness near the zenith where they were especially conspicuous on account of their almost instantaneous changes in intensity.

Bright colors were noticed during the evening, but after the moon set about midnight, pale reds and blues appeared on the edges of the streamers and clouds. The display continued at intervals throughout the night. It was not more conspicuous in the north than in other directions.—*Frederick Slocum*.

Syracuse, N. Y., June 18, 1921.—On the 14th of May I was in the university observatory showing students Jupiter and Saturn when I observed a display which looked like a beautiful pointed dome in the vicinity of Saturn or higher and farther east. * * * But the next day, the 15th, I made observations by measurements by the method I use. Two spots coalescing 41,000 miles across the longest way and a single spot 29,000 miles in diameter and 94,000 the longest way from outside to outside of the two groups which had both passed the center at a point 40" to 60" north of the center of the sun's disk. * * * seemed to explain the display.—*Prof. E. D. Roc, jr., Syracuse University*.

Ashland, Ohio.—There was the single and double bow, the pale blue and the white light, and the first extra, which came at 2:30 a. m. At that hour the northeast sky suddenly became red, as if it were the reflection of a great conflagration on the earth. This great red cloud moved south and then straight west, along the zenith, until it reached the far western horizon. It remained several minutes, a beautiful red, and then turned to a brilliant white light, of surpassing beauty. A few patches of clouds made their appearance in the sky at this time, which added greatly to the sublimity of the scene.—*S. W. Brandt, Cooperative Observer*.

Ames, Iowa.—Against a clear moonlit sky a brilliant auroral display was observed between 8:30 and 10:30 p. m., May 14. The arch which was visible throughout this time except at short intervals, formed in our magnetic north and extended about 15° above the horizon they converged to a focus at a point somewhat variable in position but approximately 15° south and west of the zenith, which point, the magnetic zenith, became a center of radiation for the streamers. About 15 minutes before the maximum development of the display, streamers of red were seen to rise from the horizon a few degrees south of east and to extend through the radiant center to the horizon about the same distance north of west, forming an arch along a magnetic parallel.

The maximum degree of brilliancy was attained at 9:27 p. m. (90th meridian time) when the streamers from a large coronal area formed about the magnetic zenith, extending to the horizon in all directions, lighting the entire heavens. The radial streamers were visible within a few degrees of the moon which had just passed the first quarter. At this time a dark area a few degrees south on the horizon closely resembled an auroral arch, but a definite segment of a circle like that on the northern horizon could not be discerned.

The shades, tints, and hues, changeable and increasing from the beginning of the observation, now became more distinct and all of the primary colors appeared in varying degrees of intensity. Reappearing intermittently, the colors gradually faded away during the remaining hour of the display.—*John E. Smith, Iowa State College*.

Des Moines, Iowa.—The first indications of the so-called "celestial conflagration," during the night of May 14-15, were observed about 9 p. m. Pale white, wavering beams of light covered nearly the entire visible sky. After a minute survey of the heavens was made, it was noticed that the "auroral arc" was missing, but at a point approximately 10° south of the zenith, a vast system of pulsating, shifting, and playing shafts of light converged in a quivering mass. At 9:25 p. m. the canopy of light assumed curtainlike tendencies with glittering columns of flame stalking across the northern horizon. Across the southern, streamers of white light seemed to filter down, resembling the bursting of a giant star shell. At 9:30 p. m. an observation was made for the northern arc, and it was noticed that in the north, reaching up probably 15°, there was a bank resembling an intensely purple cloud through which no stars could be seen. This formation was thought at first to be a cloud, but its appearance was of the nature of an auroral arc, minus the light. At 9:35 p. m. this peculiar cloud suddenly dissolved and took the usual form of the auroral arc, through which the stars could be seen shining brightly. Immediately the violent pulsations began radiating from the arc in the north. The sheets and streamers of light constantly played and pulsed, like puffs of breath against a window pane, low down, then rising up and up and into the ever-changing colored mass of quivering light, slightly to the south of the zenith.—*Arthur J. Haidle, Observer, Weather Bureau*.

Drexel, Nebr.—The aurora of May 14 first became visible in the northern sky at 9 p. m. It gradually advanced in a series of great arcs, passing beyond the zenith and toward the southern horizon. This display was the greatest and brightest of the three and covered the sky more completely than any ever observed at this station. At 9:40 p. m. the entire sky, except a thin strip along the southern horizon, was covered with intermingling masses of light. The predominating color was yellow, but splashes of red, orange, and green tints appeared at intervals in different parts of the sky.

The magnetic activity was probably greatest between 9:30 p. m. and 10:30 p. m. as the effect on telephone and telegraph instruments

was greatest at this time. The aurora, however, continued overhead with undiminished brightness until after midnight. At 11 p. m. the heavens appeared like the roof of an immense gold-lined cave with stalactites (curtains) of light extending toward the earth. Streamers of delicately tinted light shot up from every part of the horizon. One Omaha newspaper likened the aurora to "a great tent of light that completely covered the city." Although the moon was shining brightly, it passed unnoticed amid the greater brightness of the aurora.

The phenomenon continued with gradually diminishing intensity until about daylight of May 15th.—*H. L. Choate, Observer, Weather Bureau*.

Portland, Oreg.—The phenomenon last night was said to be the most aggravating, from a telegraphic standpoint, in years. Wires which normally carry a voltage of 150 were charged as high as 450, either negative or positive, thus giving a variation of approximately 900 volts difference in potential. Electric lights were burning in the Western Union office with voltage drawn from the earth through ground wires at Spokane and Nampa. The delicate volt-millimeter needle, which ordinarily stands at zero, was jumping about like a compass needle, now registering 400 volts positive (current flowing toward Portland), and a few seconds later indicating the same amount of negative current.

At Walla Walla the northern lights were said to be hanging over the city much like a large umbrella, and they were reported clearly visible in other inland towns. Denver reported unaccountable complications due to ground wires drawing voltage from the earth. The demonstration, varying in intensity, has been constant for the last 36 hours, although the lights themselves were almost indistinguishable here last night on account of the hazy atmosphere.—*Oregonian*, May 15, 1921.

Across the sky a trifle to the west of north flashed horizontal rays of blue and red, the latter predominating. Beginning like a last fading ray of a glorious sunset the phenomena slowly took on changing hues. From the tops of downtown buildings and vantage points on the heights the view was wonderful. It began about 8:40 and continued until after 10.

Beginning with intermittent glow in the northern sky, the sheet of reddish and white light rose, each flash being higher than the preceding. After a time it seemed the level had been reached. Streamers shot high in the heavens, moving across the sky from east to west like the beams of a huge searchlight.—*Journal*, May 15, 1921.

Beaver, Utah, May 14-15.—Local spectators report that the Aurora resembled, at times, a huge fountain of fire, spouting brilliantly colored flames in every direction. A curious feature was the fact that it seemed to be moving toward the south, as this latitude, about 37° is south of the zone of frequency for auroral displays.—*Beaver Press*, May 20, 1921.

Washington, D. C.—At 8:45 p. m. at Chevy Chase, Washington, D. C., there was visible through a small rift in the clouds in the northeast an appreciable glow of greenish light characteristic of an auroral display. Later heavy clouds (with a thunderstorm) prevented any view of the display.—*C. F. Brooks*.

At about 11 p. m. near the navy yard (SE.), Washington, D. C., a brilliant display of the aurora was visible. The rays of light spread in all directions from a radiant point near the zenith. I awakened several friends to view the spectacle, got the clerks in a neighboring drug store to come out to see it, and telephoned to Mr. Shaw in Chevy Chase, who reported a thunderstorm in progress in the sky and no aurora visible.—*L. M. Pace* [from conversation with C. F. Brooks on May 17, 1921.]

San Francisco, Calif.—The aurora borealis, lights of various colors in the sky, common in the north but seldom seen as far south as San Francisco, startled many last night with what looked like a "shimmy of colors" in the heavens.

As far south as the Mexican border electric discharges in the sky were plainly visible, the first time in history, according to old-time residents.

Santa Fe train dispatchers say the lights were also clearly seen on the Mojave desert, nearly all points reporting having witnessed them for the first time within the records of the various weather offices.—*San Francisco Examiner*, May 15, 1921.

Grand Junction, Colo.—It is believed that it was a most unusual display of the "northern lights" or aurora borealis, which developed strange green phosphorescentlike wreaths, clouds, and odd shapes in the southern sky while the whole northern sky was by turns lavender, purple, red, and light green. It was wonderfully beautiful, weird, and awe-inspiring. * * *

Andrew J. Halligan, merchant police, reports that a slight display of red aurora was visible Friday night, but nothing like the display last night.

At midnight directly overhead there were many bright flashes which looked like the beam of a powerful searchlight playing across the heavens. It would wink and go out, then instantly reappear. * * *

At midnight the whole northern part of the sky was a brilliant pale green.—*Daily News*, May 15, 1921.

Rome, Ga., May 14-15, 1921.—At 8 p. m. pale light noted from NW. to NNE., 15° above horizon; general intensification of light in north at 8:35; * * * 9:54 p. m. suddenly became very bright in ESE; * * * 11:57 p. m. active period begins. Many rapidly changing streamers from NNE. (streamers coming from bright arch at 45°).

¹ Reprinted from *Science*, New York, June 3, 1921, pp. 515-516.

² Reprinted from *Science*, New York, June 3, 1921, page 516.

* * * 3 a. m. only bright light from NW. to NE. at 40°.—*Robt. W. Graves, jr.*, Tremont Meteorological Observatory.

Austin, Tex.—The aurora borealis or northern lights was visible from 9 to 10 o'clock in the eastern heavens, while an hour later a "tequila moon" was visible.

During the period of visibility of the aurora lights were seen to shoot up from the horizon on the northeast and make an arc across the eastern skies toward the southeast.

The sky was of a dull red, and the lights shot up sometimes as many as half a dozen at a time.—*Austin American*, May 15, 1921.

San Antonio, May 14.—The aurora borealis or northern lights was visible in San Antonio for more than an hour Saturday night between 9:30 and 10:30 in a brilliant display of white shafts of light, patches, and spots. As far as known this is the first time that this phenomenon of the sky has ever been visible this far south.

The usual heavy static conditions which accompany the aurora borealis rendered the giant radio station at Fort Sam Houston useless at times.

The shifting paths of light and sudden illumination of the sky resulting in hundreds of calls to police headquarters by citizens who, unaccustomed to the visit of the northern lights were at a loss to determine the unusual conditions.—*Dallas Times*, May 15, 1921.

Taylor, Tex.—The appearance of a phosphorescent glow among the clouds first attracted the attention of the observer while watching the progress of a thunderstorm in the northeast. This glow became brighter shifting from the northwest to about due north and back again many times in rapid succession.

It resembled the light of a powerful searchlight, the summits of the cumuli being of silver brightness. The phenomena lasted for about 35 minutes, and occurred between 9.15 p. m. and 10 p. m.—*Taylor Democrat*, May 16, 1921.

Ajo, Ariz.—Ajo was treated Saturday night to a magnificent exhibition of the aurora borealis or northern lights.

The wonderful spectacle was first seen around 8 o'clock and was visible most of the time until a late hour.

Centering to the north, it extended as far in the sky as due west, and was even reported seen still farther south. After midnight it had spread to almost, if not quite, due east.

Various colors were displayed, including blood-red, blue, and orange. It appeared in detached portions, as well as in connected portions that extended clear across the sky. Faint rays or shafts of light were frequently seen extending from the horizon in the north clear to the zenith. The background resembled clouds or dense haze.

The changes were often like lightning, especially in the detached portions—no sooner had one seen the light here than it began to fade away, and in a few seconds was gone, only to appear in some other place. The night was perfectly clear, and the wonderful visitor was seen at his best.—*Ajo Copper News*, May 21, 1921.

Phoenix, Ariz.—The moving curtain of light made its appearance about 8 o'clock last evening, and continued intermittently until a late hour.

The aurora appeared in the northern sky, and extended from the eastern to the western horizon. The blaze varied continually in intensity, and moved across the sky, or brightened and faded, in a continually changing glory of light, through which the starshine with undiminished brilliancy. At times there were three distinct lines of light, outlined like the lower edges of draperies, which grew brilliant and then lessened in intensity in an ever-varying degree of luminosity, while long streamers of faint light—the "rays" which northern observers have described in connection with the appearance of the aurora borealis—were dimly visible, extending from the streaks of light to the zenith.—*Arizona Republican*, May 15, 1921.

Tucson, Ariz.—A very fine display of the northern lights was observed here on Saturday night, May 14, to daylight Sunday morning. It was first observed at 8:30 p. m. and was most conspicuous in extremely bright patches here and there in the sky, lasting usually not over a minute, with large arcs crossing the northern horizon. It was slightly cloudy, especially overhead and toward the northeast, but bright patches of aurora could be seen in the west, and here and there groups of fine lines were visible, having always a slant of 60° from the horizontal, corresponding to the dip of the compass at Tucson.

The colors were a dull white, changing to a greenish tint in the northerly glows, a brilliant pearly luster in the patches and an occasional strong red color over large indefinite areas.

The display appeared to become somewhat less intense at 10:30 p. m., but shortly afterwards showed renewed activity, especially in long lines extending over large parts of the sky, which was now nearly clear, and all pointing toward a vanishing point of perspective situated about 30° south of the zenith and a little to the west of the meridian, which is the direction of our lines of magnetic force extending toward the South Pole. This vanishing point was very beautiful and was observed by many people. By 1 o'clock the display had somewhat diminished, but a later view at 3:30 showed a perfectly clear sky and the ordinary arcs crossing the northerly horizon with occasional nearly vertical streamers extending upward. This was observed in many other parts

of Arizona and far exceeds the recollection of anything of the sort seen here in 40 years. I have notes on four previous occurrences. One was seen from Flagstaff, Ariz., in the winter of 1894-95, one was reported to me on November 5, 1916, and faint displays were seen here on October 9 and December 13, 1920. This was the first display of northern lights for most of the people of this part of the country.—*Prof. A. E. Douglass*, Steward Observatory.

San Juan, Porto Rico.—Early Sunday morning, May 15, an aurora of unusual brilliancy was seen by many people of San Juan. It occurred after midnight (of the 14th) and lasted half an hour or more. The following description was given by Inspector of Police Doby, who in previous years had witnessed a number of auroras in northern Montana and was therefore quick to recognize this phenomenon which is so rare in Porto Rico. In fact, this was the first aurora seen here in 22 years.

Here is Mr. Doby's account: "The sky in the north was brightly alight and seemed filled with golden haze. Five great bars of extra brightness, extending from the horizon to the zenith, starting from a common axis, with diverging arcs about equal, extended through the golden haze and gave a wonderful effect."

Sunny Bank, Gordon Town, about 6 miles to northeast of Kingston, Jamaica.—On Saturday evening, May 14, at 10:40 p. m., the northern sky was filled to an altitude of 50° with a ruddy glow, which appeared something like the reflection of a tremendous bush fire, but approximated rather to a crimson color. At the same time shafts of orange light were projected from behind the hills, covering about 60° of the northern sky, in azimuth, and reaching an altitude of 40°. Each shaft of light was like the beam of a searchlight, its edges sharply defined, but was less diffused, i. e., the beam was of more nearly the same breadth throughout its length. The more remarkable feature was the constancy of the shafts of light. There was no movement noticeable during the 20 minutes or so during which they were under observation. At one time 16 shafts were counted over the space of about 60° in azimuth, and these remained steady for a considerable time.

This appears the more remarkable when we remember the latitude of observation 18° north.—*Lieut. A. W. Tucker*.

Negril Point Lighthouse, West Jamaica.—On Sunday, 15, at 12:45 a. m., a strange light from the north-northwest and north was seen by the keepers on the horizon. It was yellowish white, and resembled, from the description given, the aurora borealis or northern light. It was seen for some little time after 1 a. m. Sunday, but how long the keepers can not say, as it did not interest them very much, and they thought it may have been a searchlight.—*J. S. Brownhill, superintendent*.

Morant Point Lighthouse (to the east of Jamaica).—The aurora borealis was seen here on Sunday (15th) morning from 1 to 2 o'clock. There was a rosy flush in the northern sky, and at 1:20 a. m. the "lances of light" appeared, reaching upward to 50°, alternately fading and brightening until 2 a. m., when the aurora faded out.—*Chas. Durrant, superintendent*.

Caribbean Sea, south of Cuba.—On the night of May 14 Lieut. Ostram, of the U. S. Navy tug *Montcalm*, observed a brilliant aurora.

British S. S. "Antillian" (Capt. W. E. Wood).—May 14, at 10 p. m., ship's time. Position, latitude 22° 07' N., longitude 86° 33' W. Course 541° true. Barometer 29.87 inches, temperature 79° F.; wind E. by N.; 3; clouds A-cum. from southwest, amount 9. 9:50 p. m. observed peculiar color effect in sky in northeast direction from ship. Small portion of sky showed a decidedly reddish-brown color, which lasted about 10 minutes and resembled very much the reflection of a fire, except that light was steady and not flickering. From midnight on the 14th to 2 a. m. on the 15th sky to the north and northeast bright as though dawn was breaking, long streaks of light continually flashing, sometimes from about 20° altitude to the zenith. The streaks of light were parallel to each other, not radiating from a center. Color of sky in that direction similar to that reported earlier in the evening. Moon set at 12:30 a. m. This was apparently a display of aurora borealis.—*Observer A. T. Wood, third officer*.

Sinaloa, Mexico.—The northern light display of May 14 was very plainly visible from the mesa here—only a few miles from the Tropics. The Indians have been firing the forests to hasten the advent of the summer rains, and when I first observed the glow along the sky line formed by the Sierra Madre I thought they were indulging in their propitiation of the gods on a rather larger scale than usual. The glow began about 8 o'clock, and the rays were first visible about 15 minutes later. They were white to pale yellow in color, ever-changing in form, location, and brightness. Many of them appeared to reach an east-west great circle through the zenith, those low down in the eastern sky appearing longer. The apparent focus was several degrees east of north.—*J. Gary Lindley*.

North Pacific Ocean.—News of a remarkable display of electrical phenomena last Saturday night, May 14, was brought to Honolulu to-day by Capt. E. Peterson, master of the Matson freighter *Hyades*, which arrived this morning from Puget Sound after a voyage of 12 days.

Capt. Peterson made public a letter which he has mailed to the local United States Hydrographic Survey for its information, and which describes the display as follows:

* Reprinted from *Science*, New York, July 1, 1921, p. 14.

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"May 14, at 8 p. m., in latitude 33.18 N., longitude 146.44 W., temperature 62, barometer 30.38. On this particular evening I observed numerous bright streaks which resembled the aurora borealis, in a north and south direction covering about two-thirds of the heavens and giving the northern portion of the sky a peculiar reddish tint.

"During this time the sky was very clear excepting the northern part close to the horizon. At 9:15 p. m. the streaks disappeared, leaving the north and eastern part of the sky very red for about 15 minutes, then gradually getting fainter until at 10:45 p. m., when it completely disappeared."

Capt. Petterson says the display was a magnificent one and that the rays resembled a great battery of searchlights, lighting up the clouds with a pure white color. The rays were white, but the sky was red. He says he has never seen anything like it in all the years he has been on the Puget Sound-Honolulu run.—*Honolulu Star-Bulletin*, May 19, 1921.

Apia, Samoa.—In the evening, between 6 and 7 p. m., a display of the aurora australis, a usual accompaniment of these magnetic disturbances, was observed. It was an extremely bright display, as otherwise it could not have been seen at all in the moonlight, and it is also a very rare event to see this phenomenon in latitudes near the equator. It is to be expected that news from the outside world will mention interference with the work of submarine cables and telegraphic work generally.—*Samoa Times*, May 28, 1921.

The following is a portion of a communication by Dr. A. L. Cortie in *Nature*, London, June 2, 1921, pp. 426-427.

On May 8 there appeared on the sun's eastern limb an equatorial sun spot in a region which has been without disturbance for some considerable time. It was an active spot which had separated by May 12 into two large spots. The maximum area of the group was 16.5, in units 1/5000 of the sun's disk, and this was attained on May 14. * * *

The mean heliographic latitude of the earth during the passage of the group across the sun was -2.8° . Therefore, not only was there a large active sun spot on the sun, and with the penumbral character which frequently marks spots associated with magnetic disturbance, but also the earth was very favorably situated with regard to it. Under such conditions a great magnetic storm is inevitable.

WATERSPOUTS ON LAKE ONTARIO.¹

551.59 (285: By ELLIS GAY.

71:73) [Pultneyville, N. Y., Aug. 5, 1921.]

I observed this phenomenon from Gates Grove, on lake shore about half way between Nine Mile Point and Pultneyville, Aug. 2nd. The weather conditions seemed peculiar—heavy cumulus clouds over the horizon, practically no wind; but about 9 a. m. a heavy swell from the northeast commenced, which I thought indicated a disturbance in that direction, although we could see no line of wind, as is often the case. About 11:30 a. m., I noticed on the eastern horizon what I thought to be the smoke of a steamer, "hull down," but could make nothing of it with the glass. As our eastern view is partially hidden by a point, I should guess that it was about off Pultneyville (5 miles). I paid no further attention to it for a few minutes (less than 10), when I again looked, it was directly in front of the cottage, almost due north. There was a smokelike disturbance on the surface of the lake of considerable size, and rising from it was a thin ribbon-like streamer which widened gradually until it was lost in the clouds. This streamer was visible against the low-hanging cumulus clouds which lay beyond it, as well as in the small portion of the horizon which was clear. As I could not tell how far away it was, there was no way of estimating the height of the cone, although I should guess it was 3 to 5 miles out and at least 1,000 feet high. (Other observers guessed a mile high.) Through glasses a rotation could be plainly discerned, and though there was a diversity of opinion, I am convinced that it was counterclockwise. The spout traveled from east to west at a good rate of speed, probably 40 to 60 miles per hour. While we were watching, another spout was formed ap-

proximately a mile from the first. I saw the column reaching down from the clouds finally touch the surface and make a disturbance similar to the original one. Later we saw a third column reach down; but it did not come to the surface. Two complete and one partial spout were visible at one time. They seemed to melt away when they were a few miles west of us. The duration of our observation was about five minutes. The sky in the west below the clouds showed a decided copper tint, and it looked as though there might be a thunderstorm somewhere north of Charlotte. The phenomenon had entirely disappeared at 12 m.

From all the data I have been able to find on the subject I am satisfied that we saw waterspouts.

ANOTHER OBSERVATION OF WATERSPOUTS.

By HOMER B. BENEDICT.

[Brockport, N. Y., Aug. 23, 1921.]

In the *Rochester Democrat & Chronicle* for Aug. 5th, I saw an account of a waterspout seen on Lake Ontario east of Rochester on Tuesday, Aug. 2nd.

To corroborate the fact that such a phenomenon was seen, I wish to state that my family and myself saw such a waterspout or cyclone on this same date, over the lake about the middle of the forenoon, at my farm in the town of Hamlin, about twenty miles west of Charlotte.

My attention was first called to it by my son and others, calling to come out and see a strange cloud. When I reached the lawn I found all the members of the family collected, watching this mysterious cloud. It did not last long.

This cyclone cloud or waterspout, so-called, reached from the horizon line more than half way to the zenith. My first thought was a cyclone, for it was a very awe-inspiring sight and it seemed as if it might come towards where we were standing. Instead it moved westerly along the lake. At the point where it touched the water it looked as if smoke were arising from the water, which we decided was the water sucked up by the wind.

I do not believe that the cloud itself was composed of water, as it disappeared suddenly, without any mass of water falling into the lake, so far as we could see, but at the point where it touched the water there was evidently a great disturbance. One could imagine a great elephant's trunk, reaching from the sky to the water's surface. At the upper end it was funnel shaped or cone shaped, and then ran in a narrowing form to the water line. It was a swirling streak of cloud, and as we stood watching it, wondering what was to happen, it parted in the middle, part drawing into the clouds and the other gradually disappearing toward the lake; and then as if by magic it came together again in a narrower form, but still reaching from the water to a great height in the clouds. But all the while one could see what looked like smoke arising where the end of the cloud touched the water, and even when the cloudy pillar had disappeared the smoky spot could be seen traveling up the lake.

The day was rather sultry and the clouds looked like thunder caps.

Shortly after the cloud disappeared waves rolled in on the beach, showing that they had been tossed up by the wind, but on shore we had felt no unusual amount of wind.

I also read an account in some paper. I can not tell where, that Howard Palmer of Union Hill saw a similar cloud on this same day, which lasted fifteen or twenty minutes. As I said before, the one in front of our cottage lasted but a few minutes. I am told that there were others at Straight Lake who saw the cloud.

¹ Waterspouts are rarely observed on the Great Lakes. The only previous spout on Lake Ontario of which there is a record occurred on Sept. 19, 1889. Spouts were reported on Lake Erie, off Buffalo Breakwater, Aug. 19, 1919.—Ed.